

All District Engineers

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Special Provision for Superpave Bituminous Concrete Mixtures
(Low ESAL)

January 9, 2004

This special provision was developed by the Bureau of Materials and Physical Research. It has been revised based on the recommendations by the Bituminous QC/QA Technical Working Group.

This special provision should be included when a Superpave mixture is required for a low volume (ADT) application and should be used in conjunction with the special provision, "Quality Control/Quality Assurance of Bituminous Concrete Mixtures".

The districts should include the BDE Check Sheet marked with the applicable special provisions for the April 23, 2004 and subsequent lettings. The Project Development and Implementation Section will include the paper copy in the contract.

This special provision will be available on the transfer directory January 9, 2004.

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SUPERPAVE BITUMINOUS CONCRETE MIXTURES (LOW ESAL) (BDE)

Effective: January 1, 2001

Revised: April 1, 2004

Description. This work shall consist of constructing Bituminous Concrete Surface Course Superpave IL-9.5L and/or Bituminous Concrete Binder Course Superpave IL-19.0L according to Section 406 of the Standard Specifications and the special provision "Quality Control/Quality Assurance of Bituminous Concrete Mixtures", except as modified herein.

Materials.

- (a) Coarse Aggregate. Coarse aggregate for the IL-19.0L shall meet the requirements of a Class I Type 3 binder course and the gradation specified below. For the IL-9.5L mixture, the coarse aggregate shall meet the requirements of a Class I Type 3 surface course except that gravel and Class C Quality, or better, aggregate may be used.
- (b) Reclaimed Asphalt Pavement (RAP). RAP shall meet the requirements of the special provision, "RAP for Use in Bituminous Concrete Mixtures".

RAP containing steel slag will be permitted for use in top-lift surface mixtures only.

- (c) Bituminous Material. The asphalt cement (AC), unless otherwise specified on the plans, shall be performance-graded (PG) 58-22. The AC shall meet the requirements of Article 1009.05 of the Standard Specifications for the grade specified.

If the Contractor is allowed to use more than 15 percent RAP, a softer PG binder may be required, as determined by the Engineer.

Laboratory Equipment.

- (a) Superpave Gyratory Compactor. The superpave gyratory compactor (SGC) shall be used for all laboratory mixture compaction.
- (b) Ignition Oven. The ignition oven shall be used for determination of AC content. The ignition oven shall also be used to recover aggregates for all required washed gradations.

The Engineer may waive the ignition oven requirement for AC content if the aggregates to be used are known to have ignition AC content calibration factors, which exceed 1.5 percent. If the calibration factor exceeds 1.5 percent other IDOT approved methods shall be utilized for determination of AC content.

Mixture Design. The Contractor shall submit mix designs for approval, for each required mixture. Mix designs shall be developed by Level III personnel who have successfully completed the course, "Superpave Mix Design Upgrade". Articles 406.10 and 406.13 of the

Standard Specifications shall not apply. The mixtures shall be designed according to the respective Illinois Modified AASHTO references listed below.

AASHTO MP 2	Standard Specification for Superpave Volumetric Mix Design
AASHTO R 30	Standard Practice for Mixture Conditioning of Hot-Mix Asphalt (HMA)
AASHTO PP 28	Standard Practice for Designing Superpave HMA
AASHTO T 209	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
AASHTO T 312	Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
AASHTO T 308	Determining the Asphalt Content of Hot Mix Asphalt (HMA) by the Ignition Method

(a) Mixture Composition. The job mix formula (JMF) shall fall within the following limits:

TABLE 1. Mixture Composition		
Sieve	Percent Passing	
	9.5L	19.0L
25.0 mm (1 in.)		100
19.0 mm (3/4 in.)		95-100
12.5 mm (1/2 in.)	100	
9.5 mm (3/8 in.)	95 – 100	
4.75 mm (#4)	52 – 80	38-65
2.36 mm (#8)	38 – 65	
600 µm (#30)	< 50% of the percentage passing the #4	< 50% of the percentage passing the #4
75 µm (#200)	4.0 – 8.0	3.0 – 7.0
AC%	4.0 – 8.0	4.0 – 8.0
RAP Materials	Maximum 30% (or as shown on the plans)	Maximum 30%
#200:AC ratio	1.0 max. design	1.0 max. design

It is recommended that the selected combined aggregate gradation not pass through the restricted zones specified in Illinois Modified AASHTO MP 2.

(b) Volumetric Requirements.

Mix	Design Compactive Effort	Design Air Voids Target (%)	VMA (Voids in the Mineral Aggregate) (min.)	VFA (Voids Filled with Asphalt)
IL 9.5L	N _{DES} =30	3.0%	14.0%	70 - 80%
IL 19.0L	N _{DES} =30	4.0%	13.0%	N/A

- (c) Determination of Need for Anti-Stripping Additive. The mixture designer shall determine if an additive is needed in the mix to prevent stripping. The determination shall be made on the basis of tests performed according to Illinois Modified T 283 using 4 in. Marshall bricks. To be considered acceptable by the Engineer as a mixture not susceptible to stripping, the ratio of conditioned to unconditioned split tensile strengths (TSRs) shall be equal to or greater than 0.75. Mixtures, either with or without an additive, with TSRs less than 0.75 will be considered unacceptable.

If it is determined that an additive is required, the additive may be hydrated lime, slaked quicklime, or a liquid additive, at the Contractor's option. The liquid additive shall be selected from the Department's list of approved additives and may be limited to those, which have exhibited satisfactory performance in similar mixes.

Dry hydrated lime shall be added at a rate of 1.0 to 1.5 percent by weight of total dry aggregate. Slurry shall be added in such quantity as to provide the required amount of hydrated lime solids by weight of total dry aggregate. The exact rate of application for all anti-stripping additives will be determined by the Engineer. The method of application shall be according to Article 406.12 of the Standard Specifications.

Personnel. The QC Manager and Level I technician shall have successfully completed the Department's "Superpave Field Control Course".

Required Tests. Testing shall be conducted to control the production of the bituminous mixture. The Contractor shall use the test methods identified to perform the following mixture tests at a frequency not less than that indicated in Table 3.

TABLE 3. Required Plant Tests for Superpave (Low ESAL)		
Parameter	Frequency of Tests	Test Method
Aggregate Gradation Hot bins for batch and continuous plants. Individual cold-feeds or combined belt-feed for drier drum plants. (% passing sieves: 12.5 mm (1/2 in.), 4.75 mm (No. 4), 2.36 mm (No. 8), 600 µm (No. 30), 75 µm (No. 200))	1 dry gradation per day of production (either morning or afternoon sample). and 1 washed ignition oven test on the mix per day of production (conduct in afternoon if dry gradation is conducted in the morning or vice versa). NOTE: The order in which the above tests are conducted shall alternate from the previous production day (example: a dry gradation conducted in the morning will be conducted in the afternoon on the next production day and so forth). The dry gradation and washed ignition oven test results shall be plotted on the same control chart.	Illinois Procedure (See Manual of Test Procedures for Materials).
Asphalt Content by Ignition Oven (Note 1.)	1 per half day of production	Illinois Modified AASHTO T 308
Air Voids Bulk Specific Gravity of Gyratory Sample. Maximum Specific Gravity of Mixture	1 per half day of production for first 2 days and 1 per day thereafter (first sample of the day).	Illinois Modified AASHTO T 312 Illinois Modified AASHTO T 209

Note 1. The Engineer may waive the ignition oven requirement for AC content if the aggregates to be used are known to have ignition AC content calibration factors which exceed 1.5 percent. If the ignition oven requirement is waived, other Department approved methods shall be used to determine the AC content.

During production, the ratio of minus 75 µm (#200) sieve material to total asphalt cement shall be not less than 0.6 nor more than 1.2, and the moisture content of the mixture at discharge from the mixer shall not exceed 0.5 percent. If at any time the ratio of minus 75 µm (#200) material to asphalt or moisture content of the mixture falls outside the stated limits, production of mix shall cease. The cause shall be determined and corrective action satisfactory to the Engineer shall be initiated prior to resumption of production.

During production, any mixture containing an anti-stripping additive will be tested by the Engineer for stripping according to Illinois Modified T 283. If the mixture fails to meet the TSR criteria for acceptance, no further mixture will be accepted until the Contractor takes such action as is necessary to furnish a mixture meeting the criteria.

Control Charts/Limits. Control charts/limits shall be according to QC/QA Class I requirements, except density shall be plotted on the control charts within the following control limits:

TABLE 4. Density Control Limits	
Mixture	Individual Test
IL-9.5L	92.5 – 97.4%
IL-19.0L	93.0 – 97.4 %

Construction Requirements

Placing. The minimum compacted thickness of each lift shall be according to the following table:

Mixture	Minimum Compacted Lift Thickness, mm (in.)
IL-9.5L	32 (1 1/4)
IL-19.0L	57 (2 1/4)

Basis of Payment. This work will be paid for at the contract unit price per metric ton (ton) for BITUMINOUS CONCRETE SURFACE COURSE SUPERPAVE IL-9.5L (Low ESAL), or BITUMINOUS CONCRETE BINDER COURSE SUPERPAVE IL-19.0L (Low ESAL).

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